Attachment H

Proposal # 2001- E-207 (Office Use Only)

PSP Cover Sheet (Attach to the front of each proposal)

Proposal Title: ...el a Tules: Assessment of Restoration Opportunities

Applicant Name: Habitat Assessment & Restoration Team Inc.

Contact Name: Jeff Hart

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Amount of funding requested $ 1,470,000

Some entities charge different costs dependent on the source of the funds. If it is different for state or federal funds list below.

State cost ____________ Federal cost ____________

Cost share partners? **Yes** ___ **No**

Identify partners and amount contributed by each University of Southern California, $40,000

Indicate the Topic for which you are applying (check only one box).

- ☐ Natural Flow Regimes
- ☐ Nonnative invasive Species
- ☐ Channel Dynamics/Sediment Transport
- ☐ Flood Management
- ☒ Shallow Water Tidal/ Marsh Habit
- ☐ Contaminants
- ☐ Beyond the Riparian Corridor
- ☐ Local Watershed Stewardship
- ☐ Environmental Education
- ☐ Special Status Species Surveys and Studies
- ☐ Fishery Monitoring, Assessment and Research
- ☐ Fish Screens

What county or counties is the project located in? Sacramento, San Joaquin, Contra Costa, Solano

What CALFED ecozone is the project located in? See attached list and indicate number. Be as specific as possible 1

Indicate the type of applicant (check only one box):

- ☐ State agency
- ☐ Public/Non-profit joint venture
- ☐ Local government/district
- ☐ University
- ☐ Other: ____________
- ☐ Federal agency
- ☐ Non-profit
- ☐ Tribes
- ☒ Private party

Indicate the primary species which the proposal addresses (check all that apply):

- ☐ San Joaquin and East-side Delta tributaries fall-run chinook salmon
- ☐ Winter-run chinook salmon
- ☐ Spring-run chinook salmon
- ☐ Late-fall run chinook salmon
- ☐ Fall-run chinook salmon
- ☒ Delta smelt
- ☐ Longfin smelt
- ☒ Splittail
- ☐ Steelhead trout
- ☐ Green sturgeon
- ☐ Striped bass
- ☐ White Sturgeon
- ☐ All chinook species
- ☐ Waterfowl and Shorebirds
- ☒ All anadromous salmonids
- ☐ Migratory birds
- ☐ American shad
- ☐ Other listed T/E species: ______

Indicate the type of project (check only one box):

- ☐ Research/Monitoring
- ☐ Watershed Planning
- ☒ Pilot/Demo Project
- ☐ Education
- ☐ Full-scale Implementation

Is this a next-phase of an ongoing project? Yes ✓ No ___

Have you received funding from CALFED before? Yes ✓ No ___

If yes, list project title and CALFED number # 97-N13, # 99-B106

Have you received funding from CVPIA before? Yes ___ No ✓

If yes, list CVPIA program providing funding, project title and CVPIA number (if applicable):

______

By signing below, the applicant declares the following:

- The truthfulness of all representations in their proposal;
- The individual signing the form is entitled to submit the application on behalf of the applicant (if the applicant is an entity or organization); and
- The person submitting the application has read and understood the conflict of interest and confidentiality discussion in the PSP (Section 2.4) and waives any and all rights to privacy and confidentiality of the proposal on behalf of the applicant, to the extent as provided in the Section.

Jeffrey A. Hart

Printed name of applicant

Jeffrey a. Hart

Signature of applicant

E. Executive Summary

Title of Project: Delta Tules: Assessment of Restoration Opportunities. $1,470,000.

Applicant: Habitat Assessment & Restoration Team, Inc., 13737 Grand Island Road, Walnut Grove, CA 95690. Phone: (916) 775-4021. Fax: (916) 775-4022. E-mail: jhart@ns.net. Primary Contact: Jeff Hart

Participants and Collaborators: Biologists Dr. John Hunter & Dr. Patricia Harris, New York State Universy; Geormorphologists Dr. Douglas Sherman & Dr. Bernie Bauer, University of Southern California; Engineering services of KSN Engineers, MBK Engineers, & Jerry Ramsden, Ogden Beeman & Associates. Fish biologists Tom Taylor (Entrix) & Dr. Chuck Hanson.

The Sacramento - San Joaquin Delta is a vast labyrinth of aquatic, tidal wetland, and riparian habitat. The tidal freshwater marshes serve as a vital link between open water aquatic habitat and riparian vegetation. These marshes are mostly "tule marsh which is dominated by emergent, aquatic macrophytes of the genus *Scirpus*. As the predominant plants within this habitat, tules formed the backbone of the Delta's organic productivity and served as the principal cover type for aquatic species, including fish and aquatic macroinvertebrates. Historically, the Delta's tule marshes were far more extensive, but have been greatly reduced due to landuse and water management changes of the Delta.

The goals of this study and pilot implementation project are: **1)** Identify and map tule habitat conditions along the principal river and slough salmonid corridors in the Delta, using surveying and GIS mapping technology and plant ecological sampling methodologies. **2)** Implement a series of pilot tule restorations throughout the principal river and slough salmonid corridors in the Delta that encompass a wide range of environmental conditions, especially potentially limiting factors such as water depth, waves, and substrate conditions. 3) Determine the physical factors (stressors) limiting the growth of tule species across the range of geomorphic and hydraulic conditions present in the Delta. 4) Investigate use of tules by native fish and macroinvertebrates, especially in relationship to varying spatial configurations of tule stands. 5) Develop a GIS generated model depicting sites with high potential for tule marsh restoration. This model will be based on the pilot restorations and the map of habitat conditions.

We propose to expand the experiences gained from tule restoration sites already in progress (by HART) to other areas in the Delta. This will enable **us** to obtain a more complete geographic picture of tule distribution and restoration potential in relation to various stressors. This knowledge will greatly aid future restoration endeavors.

C. Project Description

1. Statement of Problem

a. Problem

The Sacramento-San Joaquin Delta is a vast labyrinth of aquatic, tidal wetland, and riparian habitat. The tidal freshwater marshes serve as a vital link between open water aquatic habitat and riparian vegetation. These marshes are mostly "tule marsh" which is dominated by emergent, aquatic macrophytes of the genus *Scirpus*. The principal tule species in the Delta are *Scirpus acutus*, *S. americanus*, and *S. californicus*, which are generally limited to freshwater areas. Historically, the Delta's tule marshes were far more extensive. **As** the predominant plants within this habitat, tules formed the backbone of the Delta's organic productivity and served as the principal cover type for aquatic species, including fish and aquatic macroinvertebrates. For this reason, restoration **of** tule marshes is integral to restoration of ecosystem function and of habitats for many species. The goals of this study and implementation project are to:

- Implement a series of pilot tule restorations throughout the principal river and **slough** salmonid corridors in the Delta. These restorations will encompass a wide range of environmental conditions, especially potentially limiting factors such as water depth, waves, and substrate conditions.

- Determine the physical factors (stressors) limiting the growth of tule species across the range of geomorphic and hydraulic conditions present in the Delta.

- Investigate the use of tules by native fish and macroinvertebrates, especially in relationship to varying spatial configurations **of** tule stands.

- Identify and map tule habitat conditions along the principal river and slough salmonid corridors in the Delta, using surveying and GIS mapping technology and plant ecological sampling methodologies. The assessment of tule habitat conditions will include descriptions of other plant species that occur within tule habitats, including special-status plant species.

- For the principal river and slough salmonid corridors through the Delta, develop a GIs-generated model depicting sites with high potential for tule marsh restoration. This model will be based on the pilot restorations and the map of habitat conditions.

Little, if any, scientific information exists regarding life history strategies, ecological requirements, or habitat value of the tule species found in the Sacramento – San Joaquin Delta. This may seem surprising, given that tules once formed extensive wetlands in the region. Most insights into tule biology come through studies of comparable plant species in other freshwater, tidal marshes such as in Holland, the Mississippi Delta region, the Great Lakes, or the eastern seaboard of the United States.

Habitat Assessment & Restoration Team, Inc. (HART) currently is involved with a number of pilot tule restoration projects in the Delta, including the North Fork of the Mokelumne River (CALFED Bay-Delta Program [CALFED] funding and AB 360), Georgiana Slough (CALFED funding), Steamboat Slough (U.S. Army Corps of Engineers funding). Several more restoration projects are planned (e.g., Decker Island and Webb Tract 3). Through these efforts, we have become aware of various factors associated with restoration success. We propose to expand the experiences gained from these restoration sites to other areas in the Delta. This project will enable us to obtain a more complete geographic picture of tule distribution and restoration potential in relation to various limiting factors, or "stressors," such as water depth, shoreline slope, wave and current energies, and salinity. Due to such limiting factors, restoration of the Delta to tules is not equally probable in all environments. General observations indicate a range of habitat conditions, from sites that are self-regenerating to sites that are subject to such severe conditions that geomorphic reconstruction probably is required to foster tule growth.

The geographic and ecological focus of this project will be limited to the principal salmonid migration corridors of the Delta, namely the main stems and tributaries of the Sacramento (Steamboat Slough, Georgiana Slough), Mokelumne (North and South Forks), and San Joaquin Rivers (Figure 1). Within these systems, the project area is delineated by particular upstream and downstream physical factors that limit tule growth. Upstream, tules are limited by low width/depth ratios of the tributaries. In these upper reaches, the riverbanks are characterized by steep banks with shorelines that appear too deep for tule growth. Downstream, as the tributaries widen and the width/depth ratios increase, shallow mudflat shoals develop that provide suitable environmental conditions for tule establishment and growth. This "tule reach extends downstream, to near Suisun Marsh, where increased salinity restricts these freshwater plants from extending westward.

Limiting Factors or Stressors

While in some areas of the Delta it appears that tules have naturally increased their distribution, their overall distribution has been greatly reduced from earlier times. Habitat loss may be attributed to land conversion to agriculture, flood control projects **such** as the building of levees and the placement of riprap on riverbanks, increased current energies, and boat-generated waves. It is generally agreed that the restoration of this habitat type would greatly benefit critically endangered species, enhance ecosystem function, improve water quality, and protect levees from erosion and flooding.

The principal stressors that appear to restrict tule growth include water depth, wave and current energies, shoreline slope, and salt water. While each of these stressors is discussed individually below, they often can act synergistically to decrease tule establishment, growth, and distribution. The following discussion is based on studies of similar aquatic macrophytes from other regions of the globe.

Water Depth. Expansion of aquatic macrophytes, such as tules, toward deeper areas is limited by the physical impact of the environment and the physiological response of plants to increasing water depth. A number of other factors may contribute to poor sustainability of plants at deeper elevations. Susceptibility to physical and chemical stresses increases in deeper water. These stresses include wave exposure, low redox conditions in the sediment due to high organic matter content, and low internal oxygen availability.

In general, plants growing in deeper water experience a more stressful environment than those growing in shallow water. In deeper water, emergent plants have less light available, thereby reducing photosynthesis. As plants grow in increasingly deeper water, more resources are channeled to elongation of culms (stems) with increased shoot:root ratios. In terms of biomass allocation, plants in deeper water therefore allocate more carbon to leaves and stems, with less being available to roots and to reproduction (vegetative and sexual). (Lieffers and Shay 1981; Chambers 1987). In deep water, environmental stresses combined with shifts in resource allocation result in less biomass production, reduced shoot density and tiller development, and a decreased incidence of flowering (Grace 1989; Coops 1994).

Wave Energies. Waves and currents can damage emergent plants both directly and indirectly. Direct effects include actual breakage of the plants (culms), uprooting of roots and rhizomes, seedling displacement, propagule transport, and loss of biomass (Jupp 1977). Indirect effects include soil particle sorting, leading to soil texture changes, erosion or deposition, and changes in available nutrients (Coops 1991; Chambers 1987).

To a large extent, growth form—particularly mechanical attributes of the stem-determines a plant's ability to avoid or resist the direct effects of wave action. For macrophytes, two general adaptive strategies have been recognized. Species characteristic of deeper waters tend to have a flexible, stretchy growth form that absorbs wave attack,;while species characteristic of shallow water tend to have a stiff and strong growth form to avoid the adverse effects of water movement (Coops, Geilen et al. 1994).

In deeper waters, flexible plant structures can afford to have less strength than rigid structures. Bending reduces the area of the organism that is projected into the flow, effectively streamlining it and thereby reducing the drag force (Koehl 1984; Denny 1988). Closer-to-shore plant structures often are subjected to more intense and complex fluid-dynamic forces than flexible structures could withstand. Rigid organisms cope with these forces through the use of firm attachment structures, mechanically strong organs and, typically, a streamlined growth form.

For emergent aquatic macrophytes, survival may depend largely on the relative mechanical resistance of the stems against wave forces, determined primarily by the mechanical properties of the stems. Damage to stems depends on their bending stiffness. Stems break when the wave force on the submerged parts exceeds their critical breaking force. Differences in stem anatomy are important because the proportion of sclerenchyma tissue determines the strength of the stems (Coops and Velde 1996). Consequently, the vulnerability of emergent wetland plants varies with different species. For example, *Phragmites australis* withstands exposure to waves better than *Scirpus lacustris* because of a higher bending stiffness of the stems and a lower susceptibility to breaking under mechanical stress (Coops, Geilen et al. 1996). In the Delta, *Scirpus californicus* appears much more resilient to wave attack than *S. acutus*. The former species has relatively tough, triangular stems, while the stems of the latter are softer and more pliable.

Hollow, tube-like stems, as exemplified by tules, are common adaptations to wave attack. These stems combine a relatively high stiffness with a low biomass investment. However, hollow stems carry the risk of buckling. Once lodged, such stems cease to provide physiological support to the rhizomes. The loss of each stem therefore results in a loss of energy reserves needed by the plant for vigor and expansion (Groeneveld and French 1995). Repeated lodging of stems represents a loss of carbohydrate resources and therefore reduce rhizome vigor and viability (Coops and Velde 1996). Stem lodging is positively correlated to depth of stem submergence, mean flow velocity, and stem diameter. Also, soft and flexible young stems would be expected to dislodge more readily than mature stems.

In addition to the influence of stem structure, the interaction between plants and hydraulics depends on the spatial distribution of stems. The hydraulic force affecting individual stems differs for stems in dense stands than for isolated individual stems or clumps. In groups, stems interact collectively as there is a positive relationship of increased stem density to reduced hydraulic forces. Mean flow speed and turbulence intensity are inversely related to stem density; flow energies decrease by approximately one order of magnitude when flow encounters a vegetated marsh surface and continue to decrease as vegetation density increases (Leonard 1995). Stems in groups may support each other by interfering with wave energy and diverting these forces over the entire stand in place of the individual culm. Thus, high stem densities are advantageous to aquatic macrophyte stands in the wave-exposed zone.

Moreover, sediment accretion increases with stem density (Gleason 1979). Extensive research attests to the beneficial effect of emergent macrophytes on the stability of shore environments. Bonham (1983) noted that wave energies were attenuated 60-75% by bands of wetland vegetation (four species), varying from 2.0 to 2.5 meters wide along shorelines. Even when aerial stems have a more limited resistance to wave attack, roots and rhizomes impart considerable stability to shore sediments. For example, Pestrong (1969) reported a 2-3 times increase in shear strength of sediments growing with Pacific cordgrass compared to unvegetated tidal flats. In general, wave energy transmitted through vegetation is substantially reduced compared to unvegetated flats. In addition, vegetated banks in wave-swept environments experience much less erosion and sediment transport than unvegetated banks (Coops 1996).

Shoreline Slope. Slope of the shoal environment affects wave energies. Long, gradual slopes tend to break waves off shore, whereas abrupt slopes tend to concentrate wave energies close to shore. Duarte (1986) found that the slope of the littoral zone accounted for 72% of the observed variability in biomass of macrophytes. Duarte also suggested that slope can affect physical characteristics of the site, such as sediment type and stability and nutrient composition, and can modulate wave action. In general, the biomass of macrophytes is lower where the nearshore slope is steep (Pearsall 1917; Margalef 1984).

Salinity. In tidal wetlands, salinity is a product of hydrology. Salinity is determined by the relative size of freshwater and marine inputs together with soil texture, slope, rainfall, frequency of tidal inundation, and depth to the water table (Mitsch and Gosselink 1993). Salinity substantially influences plant growth because salinity has a direct toxic effect, and reduces water availability and nutrient uptake (Marschner 1995). Sodium and chloride ions interfere with the function of some enzymes; even low concentrations can be toxic to some species. Plants cope with salinity through mechanisms that include compartmentalization of salts into vacuoles, specialization of tissues (like the endodermis) as barriers to salt uptake, and excretion of salts. Most aquatic plants lack these adaptations or possess limited tolerances of salinity.

The several species of tules sort themselves out in the Delta along a freshwater/saltwater gradient. Field observations suggest that *Scirpus acutus, S. americanus*, and *S. californicus* are freshwater species that are eliminated in saline environments. The western transition zone in the Delta for these species appears to be in the Grizzly Slough area. Another species of *Scirpus* (*S. maritimus)* tolerates saline water and is abundant in the brackish water of the western Delta.

E. Conceptual Model

Tule Distribution. In the Sacramento–San Joaquin Delta, freshwater, tidally influenced tule vegetation is restricted and limited by a number of factors. Within the Delta, the upstream limits appear to be caused by steep river banks that lack shallow mudflat environments, while the downstream areas are delineated by saltwater intrusion (Figures 1, 2). Within this "tule reach" of the Delta, the presence of tules appears to be limited by steep embankments; abrupt, steep slopes; and poor substrate associated with riprapped levees. These artificially poor conditions are made even more severe by excessive wave energies (associated with boats), especially in the narrower channels.

Restoration. The growth, survivability, and regeneration of tules vary with various geomorphic, edaphic, and hydraulic factors. Since these physical attributes vary among sites, the success of tule restoration differs among sites that are naturally regenerating, others that require only planting, and yet others that need engineering protection (e.g., brush boxes or rock prisms) or enhancement.

Habitat Value. It is anticipated that tule habitat is beneficial to macroinvertebrates, salmonids, and other special-status native fish species.

F. Hypotheses Being Tested

The following hypotheses will be tested: **1)** For all three plant species, the average growth is reduced at greater water depths (greater planting depths). **2)** There are significant differences among the tule species in the effect of water depth on growth and survival. **3)** There are significant differences among the species in the effect of wave energy on growth and survival. **4)** There are differences among the species in the effect of geomorphic position on growth and survival. **5)** Degree of bank or levee protection vanes directly with the width of tule stands. ***6)*** Fish and macroinvertebrate use is influenced by landscape location and the spatial configuration of tule stands.

G. Adaptive Management

To learn as much as possible regarding the limits to tule growth, some of the individual restoration efforts will be allowed to succeed or fail on their own. The documentation of these successes and failures will enable future restorations to succeed in relationship to species selection, water depth, slope gradient, exposure to wave energies, and water salinity levels.

2. Proposed Scope **of** Work

E. Location and/or Geographic Boundaries **of** the Project

While this project will entail a broad, Delta-wide approach, the extent of the restoration effort will be more narrowly circumscribed according to several factors, as discussed above. The project will focus on main river channel tule environments, thereby excluding isolated sloughs and upland seasonal wetlands where tules also occur. This approach therefore concentrates on environments along the principal migratory path of juvenile salmonids, including the Sacramento River (Steamboat Slough and Georgiana Slough), the Mokelumne River (South and North Fork), and the San Joaquin River. Within each slough and river system, only those channels with high width/depth ratios are suitable for tule growth; these areas typically are found in the lower drainages within the Delta. Finally, the principal tule species are intolerant of salt water. The transition zone of tolerance appears to be in the vicinity of Susuin Marsh, which will demark the lower, western project boundary. Figure **XX** shows the approximate boundaries of the project area. The counties include Sacramento, Solano, San Joaquin, and Contra Costa.

F. Approach

Map of tule range. HART employees, including Dr. John Hunter, will make use of existing maps and data (e.g., DFG Delta habitat maps) and will provide new field observations to determine the upstream and downstream extent habitat for each tule species. We will map tule stands according to areal coverage (including patch shape/size/fractual dimensions), cover classes, associated species, and physical site parameters (e.g., slope, depth, substrate). This data will be entered into the GIS data base, as described below.

Map of physical environment (KSN): Utilizing airborne GPS techniques and ground truthing, color aerial photography will be controlled and acquired along the near-shoreline regions of the project during predicted low tides. Approximately 420 stereo color exposures and 50 flight lines covering nearly 160 miles will be acquired. Photography will be scanned with a fully metric (calibrated) Wherli RM-1 scanner capable of 12 micron scan resolution with an accuracy of ± 4 microns. A mosaic of the image files will be compiled in Mr. SID compressed format, or a format compatible with ArcView 3.2 or later, suitable for 1" = 100' or 1" = 200' output scales.

Public domain and agency mapping layers will be acquired and incorporated as an overlay to the project base mapping and digital photography. Mapping layers will include bathymetric mapping and aerial photogrammetry based topography mapping currently in progress along the project channels. Available mapping layers and data base information relevant to the project will be incorporated including, but not limited to USGS topography mapping, land use, habitat, species and vegetation delineation, navigation charting and regional jurisdictional boundaries.

Supplemental aerial based topography and bathymetric surveys will be conducted for specific sites of shallow water shoals where tule habitat is perceived to exist within the project limits as determined by the research team. Specific stereo photography pairs can be utilized as needed to develop aerial based topography mapping with 2' contour intervals for additional shoreline mapping and combined with bathymetric survey data to create detailed mapping layers for the developing GIS database.

Final GIS mapping layers will be compiled in ArcView 3.2 or later format and will be based on the North American Datum of 1983 (NAD83) converted to the California Coordinate System of 1983, Zone 3 (CCS83-III) as referenced by available NGS published control monuments. Elevations shown are based on the National Geodetic Vertical Datum of 1929 (NGVD29) as referenced by available NGS and local published benchmarks. Units will be the U.S. Survey Foot.

To gain an understanding of historical trends of plant succession or habitat loss, HART will make use of historical photographs to assess natural trends of tule habitats. Where possible, this data will be presented in GIS format.

Geomorphic/Hydraulic Survev. The principal river corridors will be mapped and classified according to geomorphic and hydraulic parameters, such as length/width relationships, flow characteristics, sediment transport, tractive forces, including current and wave energies. At specified sites, pressure transducers and electromagnetic current meters will be deployed seasonally to measure characteristic flow conditions (wind waves, boat wakes, and currents) and water depths adjacent to and within both healthy and marginal tule stands and in habitats where tule stands should be viable but are absent. Tube cores will be taken for the description of substrate characteristics at these sites. Data will be used to determine limiting and beneficial conditions for tule growth, and to determine sites appropriate for potential habitat restoration.

Tule restoration. Based on information gather as described above, we will develop a tule restoration plan along the major tributaries of Delta. Restoration plantings will involve an experimental design that incorporates variations in species (e.g., ***Scirpus acutus,*** S. ***americanus,*** and S. ***californicus),*** water depth (shallow to deep), substrate conditions (riprap and sand mudflat environments), slope (gradual vs. steep), wave exposure and current (and relative to different wave attentuation structures), and freshwater/salt water environments. Comparative life history strategies will be determined through greenhouse studies under controlled conditions. Various restoration technologies will be utilized including, but not limited to, the HART-based weighted ballast buckets (Figures **3-7),** direct rhizome planting, and direct seeding. We anticipate incorporating approximately 15,000 linear feet of shoreline into the restoration design.

Model of tule restoration potential. Based on relative successes and failures of these restorations, we will develop a GIs-generated model depicting different site potentials for each species. With assistance from staff and subconsultant statisticians, an analysis of variance (ANOVA) or similar procedure will be used to determine causative relationships in tule distribution and restoration successes.

Habitat value: fisheries. Native fish species targeted as part of this sampling program include delta smelt, splittail, **Chinook** salmon ***fry,*** Chinook salmon smolts (fingerlings and yearlings), tule perch, and juvenile sturgeon. Information will also be collected on the occurrence of other fish species within various habitat units that are either predators (e.g., largemouth bass) or competitors with native fish species. The experimental design for the fishery sampling program will be based on identifying habitat units having specific characteristics in terms of location within the channel, the density and spacing of emergent aquatic vegetation, water depth, and other habitat parameters (treatment units), and corresponding habitat units in the immediate vicinity having similar physical habitat characteristics in which aquatic emergent vegetation is absent. Fisheries sampling would be conducted in each pair of habitat units (treatment and control), with multiple replicates occurring within each identified geographic strata of the Delta (e.g., salmonid migratory corridor along the lower San Joaquin River) for use in statistical analyses. Fisheries sampling would also be conducted at sites that are candidates for restoration to compare utilization before treatment to utilization after establishment of the emergent vegetation. Data resulting from the fisheries sampling would be used to statistically test the hypothesis that the occurrence, density, species composition, and species diversity of native fish within habitat units characterized by emergent aquatic vegetation are higher than corresponding controls. Statistical comparisons will be made based on fisheries collections from a variety of sampling techniques potentially including, but not limited to, electrofishing, fyke nets and/or stationary traps, pop-nets, and light traps. Data will be analyzed statistically for each individual sampling technique using normalized estimates of catch-per-unit-of-effort (e.g., density). As part of fisheries sampling within each habitat unit data will be recorded on average water depth, emergent aquatic vegetation density (number of stocks per m^2), water temperature and conductivity, Secchi depth, water velocity (average velocity near the bottom; 20% of water column depth), and near the surface (80% of water column depth). In selecting habitat units as representative treatment and control locations information will also be compiled on the location of each unit with proximity to adjacent to deeper water channels, shoreline riprap, channel width, and general salinity gradients used to put each individual habitat unit into a broader regional perspective. Sampling will be conducted within each of the identified habitat units on a quarterly basis to account for seasonal variation in the geographic distribution and occurrence of native fish species within various regions of the Bay-Delta system. All sampling will be conducted using standard protocols and procedures in compliance with California Department of Fish and Game, National Marine Fisheries Service, and U.S. Fish and Wildlife Service scientific collection permits.

<u>Habitat Value: Macroinvertebrates</u>. Aquatic invertebrates will be collected by netting and handpicking, covering all of the different microsite types within the plot (mud bottom, rock, clumps of filamentous algae, branches, and vegetation). Collections will be made in 1-minute intervals, with the collector making a running tally of how many new (for that microsite) morphospecies were found in each time interval. After each 1-minute sampling interval, total number of (#) morphospecies in the plot will be calculated and recorded. When three successive intervals' estimates of total # morphospecies cause less than 5% change in successive estimates of total # morphospecies at the microsite, sampling will cease. This method ensures that despite the different physical conditions found in each site, we will obtain a consistent level of precision for our assessments of macroinvertebrate richness in each. Timing of invertebrate sampling will be stratified seasonally to coincide with key periods of occurrence by target fish species of interest within the area. Sampling will be conducted during (1) late winter months (e.g., December–January) to coincide with periods of winter-run and spring-run chinook salmon emigration, in addition to late fall-run chinook salmon emigrants; (2) early spring (e.g., February–March) to coincide with the period of fall-run chinook salmon fry movement into the Delta and rearing; (3) late spring (e.g., April–May) to coincide with the period of fall-run chinook salmon smolt and steelhead emigration; and (4) summer (e.g., August–September) to coincide with the period of striped bass, largemouth bass, smallmouth bass, splittail, and other resident fish species use in the area.

G. Monitoring and Assessment Plans

At control and treatment sites, the research/monitoring program will collect data to test scientific hypotheses and measure variables of general interest, such as erosion/deposition, boat-wake energies, instream shade, richness and biomass of aquatic macroinvertebrates, fish species richness, and plant survival and cover.

The completed restoration/monitoring plan will address the following subjects: (1) project goals and objectives; (2) hydraulic, geomorphic, and biological description of the sites; (3) statement of hypotheses; (4) sampling or censusing designs and methods for depositional/erosional patterns, fish and aquatic macroinvertebrate use, and plant habitat establishment patterns; *(5)* data management and quality control; (6) data-evaluation protocols; and **(7)** procedures for utilizing monitoring results in adaptive management of project.

H. Data Handling and Storage

Data will be captured and stored in various formats, including GIS data (Arcview); photo monitoring (JPEG or other format), tabular format (Excel), and relational database (Access).

I. Expected Products/Outcomes

In addition to CALFED quarterly reports, information will be distributed through publications in referred journals, popular magazines, and seminars and through web site development.

J. Work Schedule

This project is divided into three phases over a 3-year period. The first phase involves study, mapping, and assessment. Nearly all of this work will be done by boat and will not require access through private property. For aerial mapping, occasional ground truthing will be necessary. This work will be conducted by Kjeldsen, Sinnock & Neudeck, Inc. (KSN), with assistance from other reclamation district engineers. Since the assisting engineers represent nearly all of the reclamation districts with jurisdiction in the project area, we do not anticipate any problems obtaining access for occasional aerial photographic ground truthing. The second and third phase involve installation of plants and other materials based on the findings from the first phase. Since the exact locations of the restorations will not be known until the end of the first phase, we would not seek permission from property owners to use their land until then. The third and final phase involves monitoring and analysis of data for the pilot restoration project.

K. Feasibility

The feasibility of this project is assured for a variety of reasons. For initial surveys, most of the work will be accomplished by boat or through aerial photography. While much of this information can be gathered without accessing private property, all of these areas fall within the jurisdiction of reclamation districts whose engineers are represented on this research team. Permission most likely will be readily granted for the limited access that we need.

From a planning and regulatory perspective, the planting of tules will not negatively affect hydraulic conveyance and should not raise concerns from local reclamation districts or the State Reclamation Board. Virtually no land transformations requiring engineering are proposed at this stage; hence, these activities would not appear controversial to potentially affected parties. Little regulatory planning would be entailed; ostensibly, a Nationwide 13 permit (with input from the State Water Resources Control Board, California Department of Fish and Game, and National Marine Fisheries Service) has been expeditiously approved for similar work.

D. Applicability to CALFED ERP Goals and Implementation Plan and CVPIA Priorities

1. ERP Goals and CVPIA Priorities

This project addresses three of the four CALFED Program objectives in improving ecosystem quality, water quality, and levee system integrity. The project meets several of the goals of the Ecosystem Restoration Program (ERP) in improving aquatic and terrestrial habitats. More specifically, the funding of this project will aid: Goal **1,** in the recovery of at-risk species in the Delta; Goal **2,** ecosystem processes and biotic communities; Goal **4,** habitats; and Goal **6,** sediment and water quality.

At-risk species include split tail, delta smelt, and salmonids. Freshwater tidal marsh habitat, dominated by tules, is one of the principal habitats along salmonid corridors. Studies have shown that shaded riverine aquatic habitat provides the following essential elements for outmigrating fish cover, resting areas from hydraulic turbulence, escape from predators, and a source of macroinvertebrates as food. The monitoring and implementation aspects of this project will aid in the understanding of ecosystem processes in relationship to habitat restoration. In particular, the capacity of certain sites to recruit sediment and initiate successional processes is crucial to ecosystem rehabilitation and increased productivity, especially of aquatic species.

The funding of this project addresses several of the scientific uncertainties mentioned in the ERP Strategic Plan: 1) Natural flow regimes. The presence of tule and other emergent vegetation serves to trap sediment and to improve water quality. Sediment transport studies generally do not identify relationships between plants and sediment interactions. HART's studies on both the Lower American River and Georgiana Slough have identified important positive relationships between plants, biotechnical features, and sediment deposition. The presence of sediment is considered an important requirement for the restoration of many kinds of habitats. 2) Decline in productivity. The presence of additional habitat in critical reaches of the Delta would likely improve conditions for critical fish species and aquatic macro-invertebrates. 3) The importance of the Delta for fisheries. The expanded monitoring and research efforts in key areas of the Delta will expand knowledge of this critical gap. **4)** Channel dvnamics, sediment transuort, and shallow-water tidal and freshwater marsh habitat. The presence of sediment fosters the establishment and growth of freshwater tidal marsh habitat. Its presence is influenced by channel dynamics, wave energies, shoreline depth and gradients, and vegetation (including type and density of plant species). This project will focus on understanding various limiting factors in the establishment and growth of this valuable habitat.

2. Relationship to Other Ecosystem Restoration Projects

This project builds on several other ongoing projects in the Delta and broadens the experimental design already being implemented (for example, #97-N13; #99-B106; AB 360 on the North Fork of the Mokelumne River; and Steamboat Slough).

3. Requests for Next-Phase Funding. NA

4. Previous Recipients of CALFED or CVPIA funding

Two other projects have been awarded to HART through CALFED funding: #97-N13 and #99-B106.

5. System-Wide Ecosystem Benefits

This project has system wide ecosystem benefits in that it focuses on principal migration corridors of salmonids and the use of these and other special status species of the principal freshwater tidal marsh habitat in the Delta.

E. Qualifications

Habitat Assessment & Restoration Team, Inc. HART will implement this project. HART specializes in natural resource surveys and habitat analyses, restoration design, nursery growing of native wetland plants, and restoration implementation. Located along Steamboat Slough on Grand Island, HART has excellent facilities to complete these studies. The corporate headquarters are located in the Delta on a 10-acre farm, and include office; corporate equipment yards; and a several-acre nursery, including potting barn and greenhouse. Tools and equipment include computers with GIS (Arcview), graphics, and statistical software; a boat and work barge, and various vehicles.

Jeffrey **A.** Hart, Ph.D., will serve as overall project manager. Dr. Hart has had considerable success in designing and implementing restoration projects (e.g., Stone Lakes National Wildlife Refuge), bioengineering projects (e.g., Dry Creek, Lower American River, and North Fork of the Mokelumne River), and resource studies (e.g., Consumnes River and Lower American River). His clients include mostly government agencies and non-profit companies such as the Sacramento Area Flood Control Agency, California Department of Water Resources, Turlock Irrigation District, Sacramento County Water Resources Division, and The Nature Conservancy. Since moving to Grand Island in July 1998, HART has successfully established a native plant nursery where considerable quantities of native plants are already under propagation. Many of the tasks for the project will be performed by Jeff Hart and his employees. Other tasks will be performed by the following subcontractors.

John Hunter, Ph.D. will provide experimental design and data analysis functions for the assessment of tule growth and survival. Dr. Hunter is a plant ecologist with over 10 years of experience in working with California's vegetation who has authored **25** publications on its ecology and conservation. Dr. Hunter is currently on the faculty of the State University of New York, where he teaches biostatistics and vegetation ecology.

Pat Harris, Ph.D. will provide experimental design and data analysis functions for the assessment of tule restorations as aquatic invertebrate habitat. Dr. Harris is an aquatic invertebrate community ecologist whose research has been published in several influential journals, including *Ecology* and *Science.* Currently, Dr. Harris is on the faculty of the State University of New York, where she teaches ecology and aquatic invertebrates.

Chuck Hanson, Ph.D. (Hanson Environmental, Inc.) and Tom Taylor (ENTRIX, Inc.) will be the lead investigators for the fisheries monitoring component of the this study. Dr. Hanson has ***25*** years of experience in designing and conducting experimental investigations and fisheries monitoring programs within the Sacramento and San Joaquin river systems and Delta. Mr. Tom Taylor also has ***25*** years experience in the Delta, most recently conducting a study of fry rearing habitat pilot study on the Mokelumne River system from Woodbridge Dam downstream to the San Joaquin River. Dr. Hanson and Mr. Taylor will contribute to the development of the fisheries monitoring component of the proposed project.

Dr. Douglas Sherman received his Ph.D. in coastal geomorphology from the University of Toronto in 1983. He is presently a Professor of Geography at the University of Southern California. His areas of expertise include nearshore processes and sediment transport. For the last **4** years, Dr. Sherman has been involved in a research program sponsored by the California Department of Boating and Waterways to study causes and rates of levee erosion in the Delta. This work is ongoing and complements the project proposed herein. Dr. Bauer (see below) has been a key collaborator in this work. Field work has included a detailed process experiment of sediment suspension by boat wakes, and the establishment and monitoring of a network of ***28*** erosion pin sites around the Delta. Dr. Sherman is the author of more than 100 scientific or technical articles and reports, and has administered more than ***$5*** million in contracts and grants. Dr. Bernard Bauer holds a Ph.D. from the Johns Hopkins University (1988) with emphasis on process geomorphology, sediment transport, turbulence, and wave-current interaction. Dr. Bauer's research encompasses morphodynamic adjustments in nearshore zones along the coasts of Florida, New York, and Ontario, as well as in fluvial systems in the Colorado River, Green River, and the Sacramento-San Joaquin River Delta. Some of this research focused specifically on the influence of "hard" engineering structures, such as groins or revetments, on modifying local hydrodynamics and sediment transport patterns. Most projects involved extensive use of electronic field instrumentation coupled to computer-based data acquisition systems, as well as standard surveying and sedimentological methods. Kieldsen, Sinnock & Neudeck, Inc. (KSN). KSN will provide surveying, mapping, and planning functions. This firm is a fullservice civil engineering and land surveying firm that specializes in the surveying, mapping, planning, design and construction of municipal, public works and water resources-related projects.

Jerald D. Ramsden, Ph.D., P.E. , Ogden Beeman & Associates, Inc. (OBA), will provide expertise in water wave engineering. Consulting assistance to be provided by OBA will include development of a wave measurement work plan and analysis of field measurements, wave propagation and nearshore transformations, wave effects on the shoreline, and wave induced loads on structures and other objects such as plants.

Other consultants. Gil Labrie, DDC Engineering.; Gilbert Cosio, MBK Engineers; Robert Miller and Associates represent nearly all of the local reclamation districts. These engineers will serve as links to the districts, and will provide engineering services and/or hydraulic analyses. Ellyn Davis, Davis Environmental Consulting, will take the lead with the planning/ permitting efforts. Her firm provides professional consulting services in biological resources regulatory compliance. Craig Fishchenich, Ph.D., P.E. and Hollis Allen (biologist) will assist in peer review.

F. Cost

1. Budget

Table I outlines the projected budget based on a 3-year program ($1,470,000).

2. Cost-Sharing.

The University of Southern California will contribute $40,000 for in-kind services.

G. Local Involvement

We anticipate that this project will be fully supported by various local reclamation districts.

H. Complianace with Standard Terms and Conditions

The applicant will comply with standard terms and conditions, including Attachment D, Table D-1, and Attachments E in the PSP.

I. Literature Cited

Bonham, A. J. (1983). "The management of wave-spending vegetation as bank protection against boat wash." Landscape Planning 10 15-30.

Chambers, P. A. (1987). "Nearshore occurrence of submersed aquatic macrophytes in relation to wave action." Canadian Journal Fisheries Aauatic Sciences ***49.***

Coops, H., F. W. B. v. d. Brink, et al. (1996). "Growth and morphological responses of four helophyte species in an experimental water-depth gradient." Aquatic Botany 54 11-24.

Coops, H., N. Geilen, et al. (1994). "Distribution and growth of the helophyte species *Phragmites australis* and *Scirpus lacustris* in relation to wave exposure." Aquatic Botany **48**: 273-284.

Coops, H., N. Geilen, et al. (1996). "Interactions between waves, bank erosion and emergent vegetation: an experimental study in a wave tank." Aquatic Botany 53: 187-198.

Coops, H. and G. V. d. Velde (1996). "Effects of waves on helophyte stands: mechanical characteristics of stems of *Phragmites australis* and *Scirpus lacustris.*" Aquatic Botany 53: 175-185.

Denny, M. W. (1988). Biology and the Mechanics of the Wave-Swept Environment, Princeton University Press.

Duarte, C. M. and J. Kalff (1986). "Littoral slope as a predictor of the maximum biomass of submerged macrophyte communities." American Society of Limnology and Oceanography, Inc. 31(5): 1072-1080.

Gleason, M. C., D. A. Elmer, et al. (1979). "Effects of stem density upon sediment retention by salt marsh cordgrass, *Spartina alterniflora* Louisel." Estuaries, Journal of the Esturarine Research Federation 2(4): 271-273.

Grace, J. B. (1989). "Effects of water depth on Typha latifolia and Typha domingensis." Amer. J. Botany 76(5): 762-768.

Groeneveld, D. P. and R. H. French (1995). "Hydrodynamic control of an emergent aquatic plant (Scirpus acutus) in open channels." Water Resources Bulletin 31(3): 505-514.

Jupp, B. P. and D. H. N. Spence (1977). "Limitations of macrophytes in a eutrophic lake, Loc Leven." Journal of Ecology 65: 431-446.

Koehl, M. K. R. (1984). "How do benthic organisms withstand moving water." American Zoologist 24: 57-70.

Leonard, L. A. and M. E. Luther (1995). "Flow hydrodynamics in tidal marsh canopies." Limnological Oceanography 48(8): 1474-1484.

Lieffers, V. J. and J. M. Shay (1981). "The effects of water level on the growth and reproduction of *Scirpus maritimus* var. *paludosus.*" Canadian Journal Botany 59: 118-121.

Margalef, **R.** (1984). Limnologia, Omega.

Marschner, H. (1995) Mineral nutrition of higher plants, Academic Press.

Mitsch, W. J. and J. G. Gosselink (1993) Wetlands, John Wiley & Sons, Inc.

Pearsall, W. H. (1917). "The aquatic and marsh vegetation of Esthwaite Water." J. Ecol. ***5*** 180-201.

Pestrong, P. (1969). "The shear strength of tidal marsh sediments." Journal of Sedimentary Petrology 39: 322-326.

Rosen, P. S. (1980). "Erosion Susceptibility of the Virginia Chesapeake Bay Shoreline." Marine Geology 34 45-59.

Table 1. Tule Habitat Assessment										
			Subject to Overhead						Exempt f/oh	
Year	Task	Direct Labor Hours	Salary	Benefits	Travel	Supplies & Expendables	Service Contracts	Overhead (0 %)	Equipment	Total Cost
Year 1	Task 1									
	Subtask 1. Aerial photography/GIS		$7,500				$170,000			$177,500
	Subtask 2. Botanical Surveys		$40,000			$5,000	0		$5,000	$50,000
	Subtask 3. Geomorph/hydrology surveys		$0				$90,000			$90,000
	Subtask 4. Fisheries/invertebrate studies		$10,000				$80,000			$90,000
	Subtask 5. Restoration & Monitoring Plan		$40,000				$10,000			$50,000
	Subtask 6. Permitting/Planning		$10,000				$10,000			$20,000
	Subtask 7. Plant Propagation		$50,000				$0			$50,000
	Subtask 8. Project Management/Admin		$50,000				$0			$50,000
Total Cost Year 1			$207,500	$0	$0	$5,000	$360,000	$0	$5,000	$577,500
Year 2	Task 2									
	Subtask 1. GIS analysis		$20,000			$5,000			$10,000	$35,000
	Subtask 2. Planning/Permitting		$5,000				$10,000			$15,000
	Subtask 3. Fisheries/Invertebrate studies		$10,000				$40,000			$50,000
	Subtask 3. Restoration/Monitoring Plan		$7,500				$5,000			$12,500
	Subtask 4. Plant Propagation		$30,000							$30,000
	Subtask 5. Restoration implementation		$200,000			$30,000	$5,000		$20,000	$255,000
	Subtask 6. Plant Monitoring		$25,000							$25,000
	Subtask 7. Project Management/Admin		$65,000							$65,000
Total Cost Year 2			$362,500	$0	$0	$35,000	$60,000	$0	$30,000	$487,500
Year 3	Task 3									
	Subtask 1. GIS analysis		$15,000							$15,000
	Subtask 2. Restoration/Monitoring Plan		$20,000							$20,000
	Subtask 3. Restoration implementation		$90,000			$15,000			$10,000	$115,000
	Subtask 4. Geomorph/ Hydro. Monitoring						$90,000			$90,000
	Subtask 5. Fish/invertebrate Monitoring		$15,000				$45,000			$60,000
	Subtask 6. Plant Monitoring		$65,000							$65,000
	Subtask 7. Project Management/Admin		$55,000							$55,000
Total Cost Year 3			$245,000			$15,000	$135,000		$10,000	$405,000
Total Project Cost			$815,000	$0	$0	$55,000	$555,000	$0	$45,000	$1,470,000

Tule Distribution on Sacramento, Mokelumne, and San Joaquin River Systems

Figure 1

HART

Conceptual Model of Freshwater Tidal Marsh (Tule) Habitats

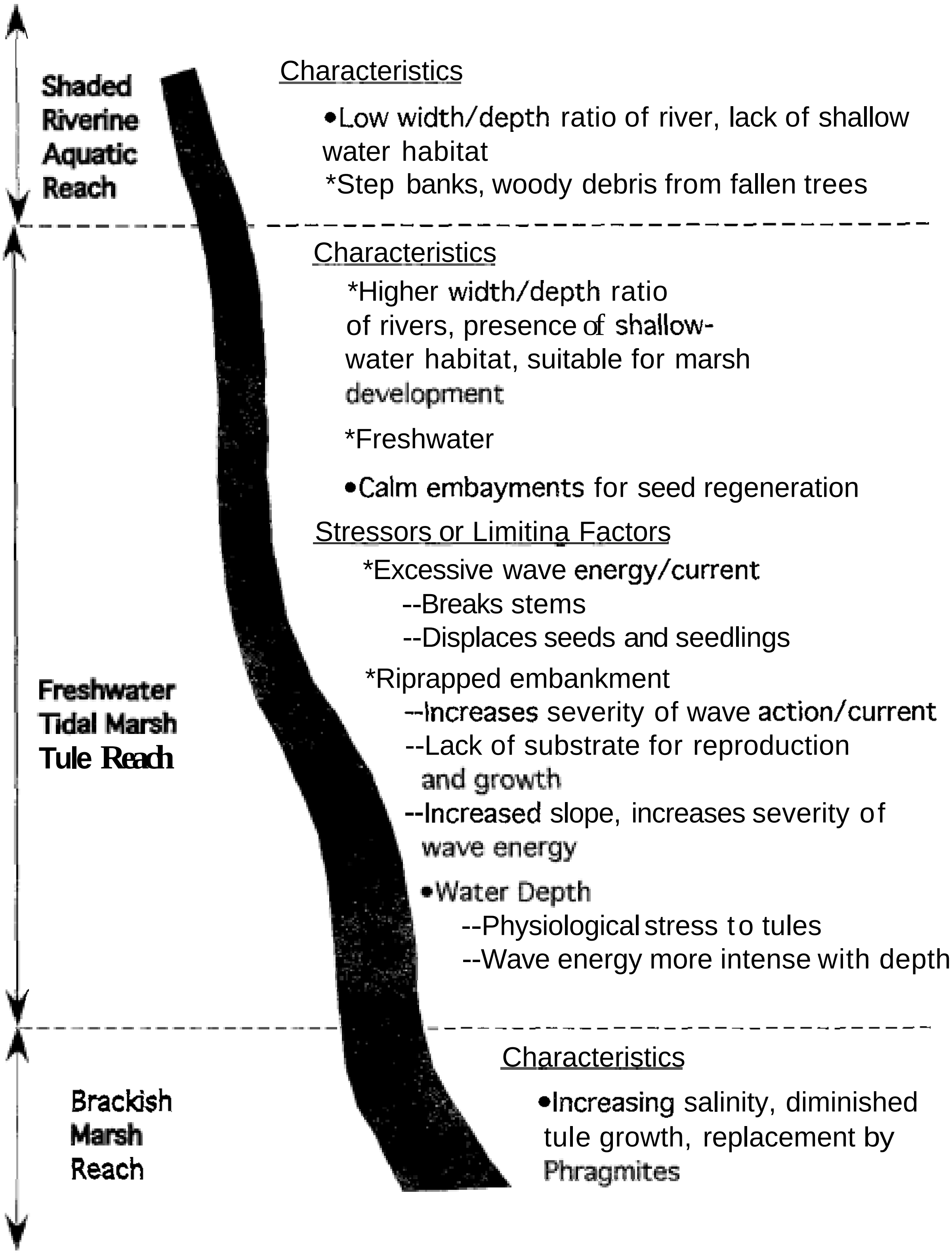
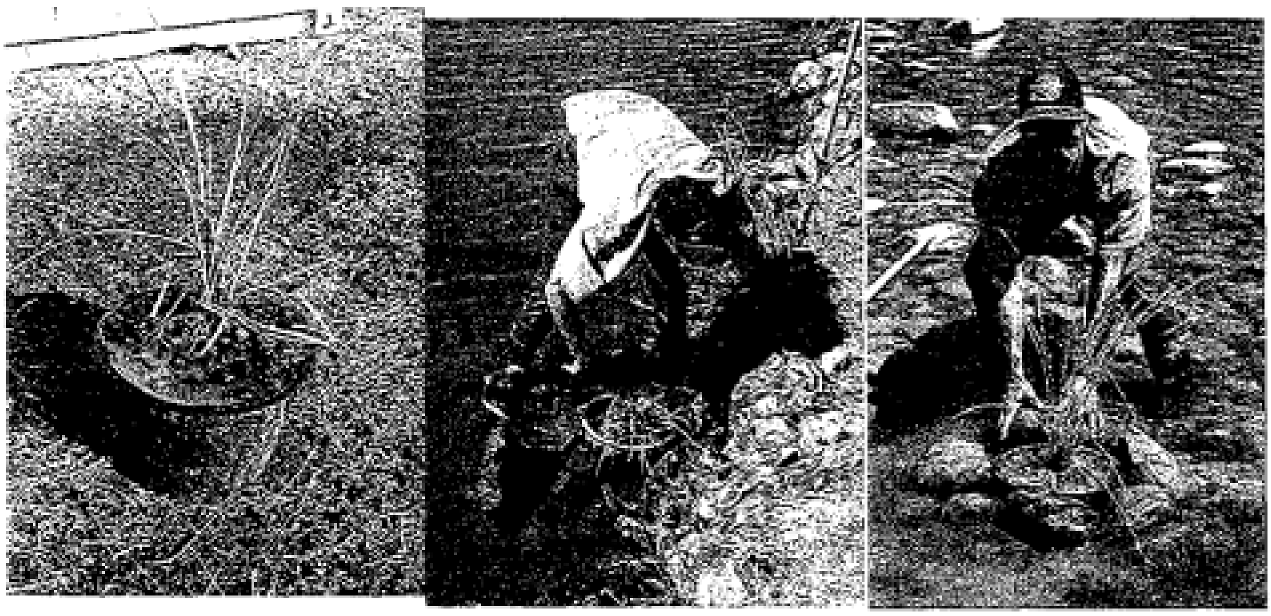


Figure 2

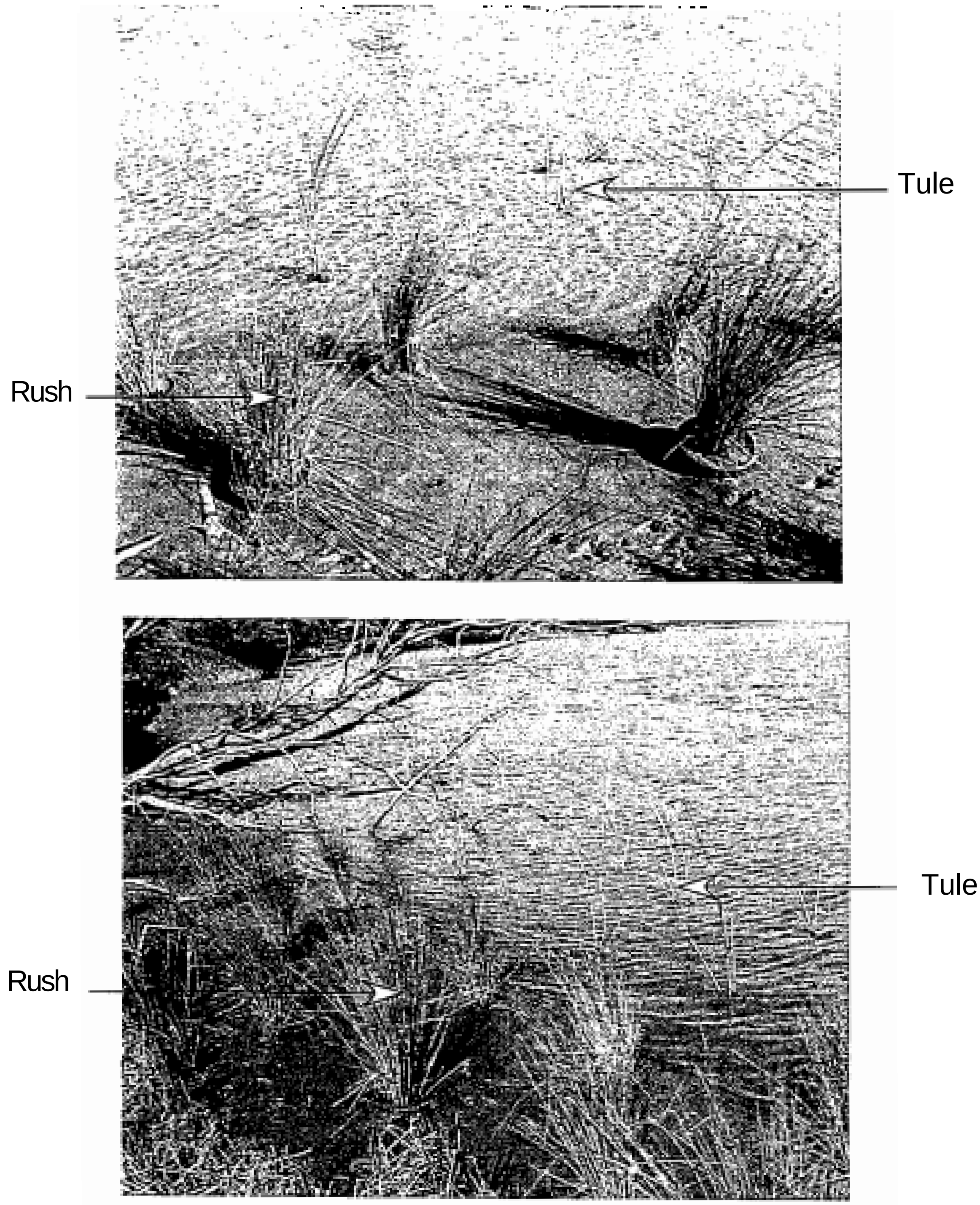
Ballast Buckets:
A New Technology for Establishing Plants in Riprap

Some plants, with their roots entwining a rock and soil matrix, are able to grow in hydraulically challenging riverine environments. To mimic these successfully established plants, a new technique called "ballast buckets" has been invented by HART. This technique involves using a mixture of scoria lava rock, soil, and plant material in biodegradable, organic buckets.



Preparing Ballast Buckets

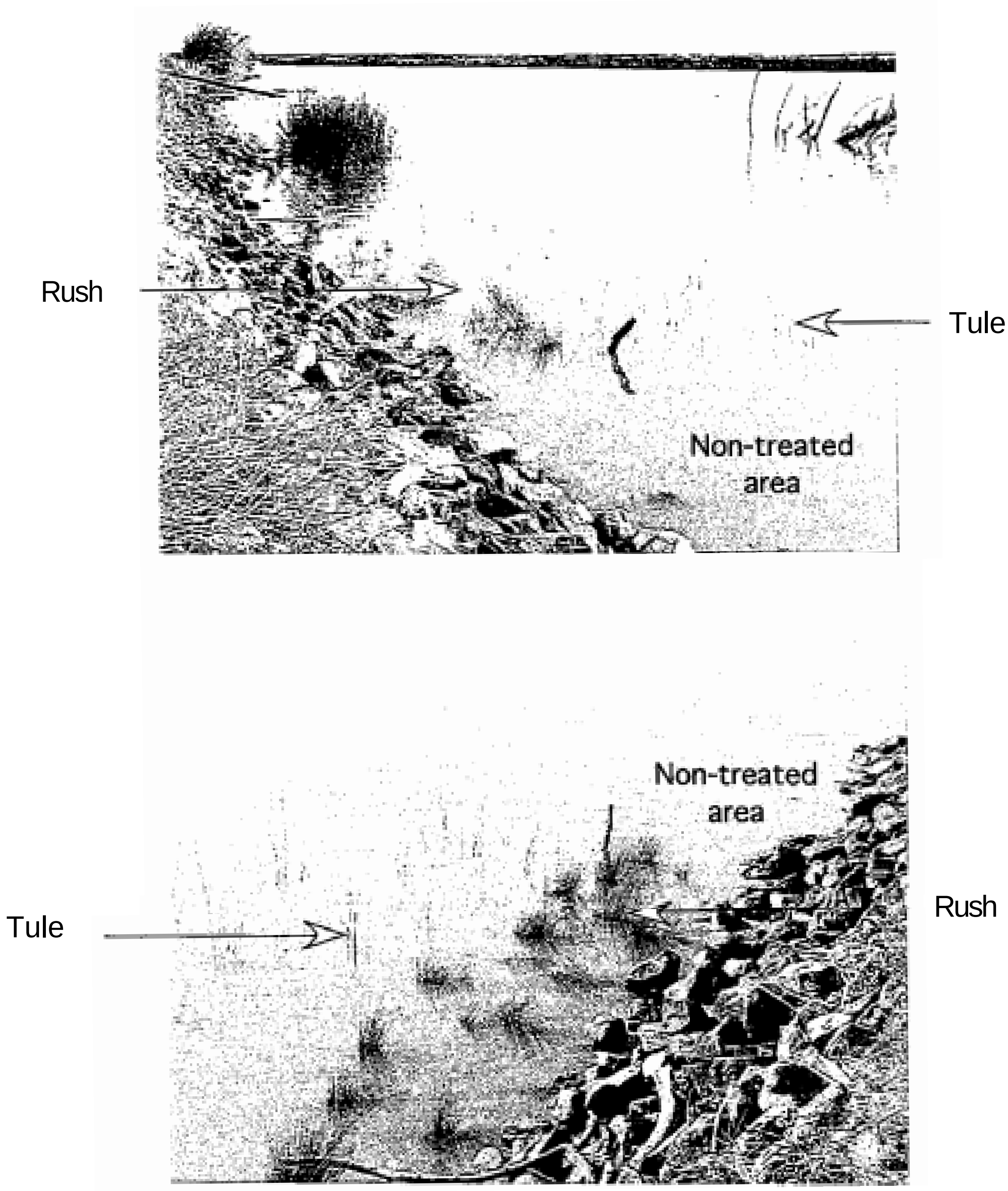
Ballast buckets can be planted in various mixtures of rock, either in the water or at the water's edge. Their initial weight anchors the plants, thus facilitating survival under extreme current flow. The roots will gradually grow out from the decaying bucket, thus further anchoring the plant to the substrate. Ballast buckets will be used on both the North Fork of the Mokelumne River and the Georgiana Slough portions of Tyler Island.



Experimental **Tule *(Scirpus californicus)*** and Rush *(Juncus **effusus**)*
Plantings on **Georgiana Slough**

This is an area being restored along a quiet, no-wake segment on Georgiana Slough. These ballast-bucket plantings have withstood a season *of* winter flooding. Formal monitoring **has** not yet begun, but it appears that nearly all of the plants have survived and are doing very well.

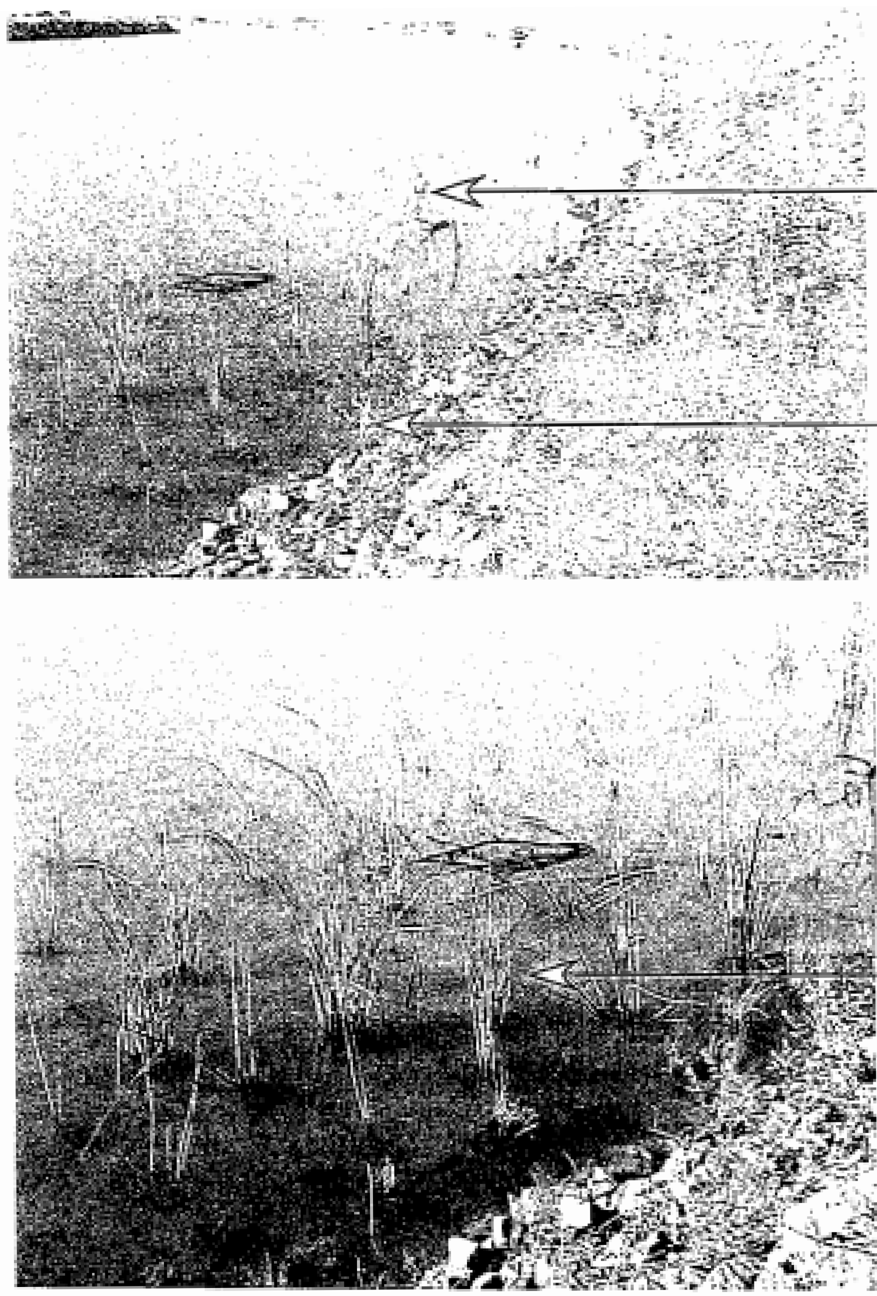
Figure 4



Experimental **Tule** ***(Scirpus californicus)*** and Rush ***(Juncus effusus)***
Plantings on the North Fork of the Mokelumne **River**

This is an area being restored along an expanded mudflat **on** the North **Fork** of the Mokelumne River. These ballast-bucket plantings have withstood a season *of* boat waves and winter ***flood-*** ing. Above: Looking upstream. Below: Facing downstream. Formal monitoring has not yet begun, but **it** appears that nearly all *of* the plants have survived and are doing very well.

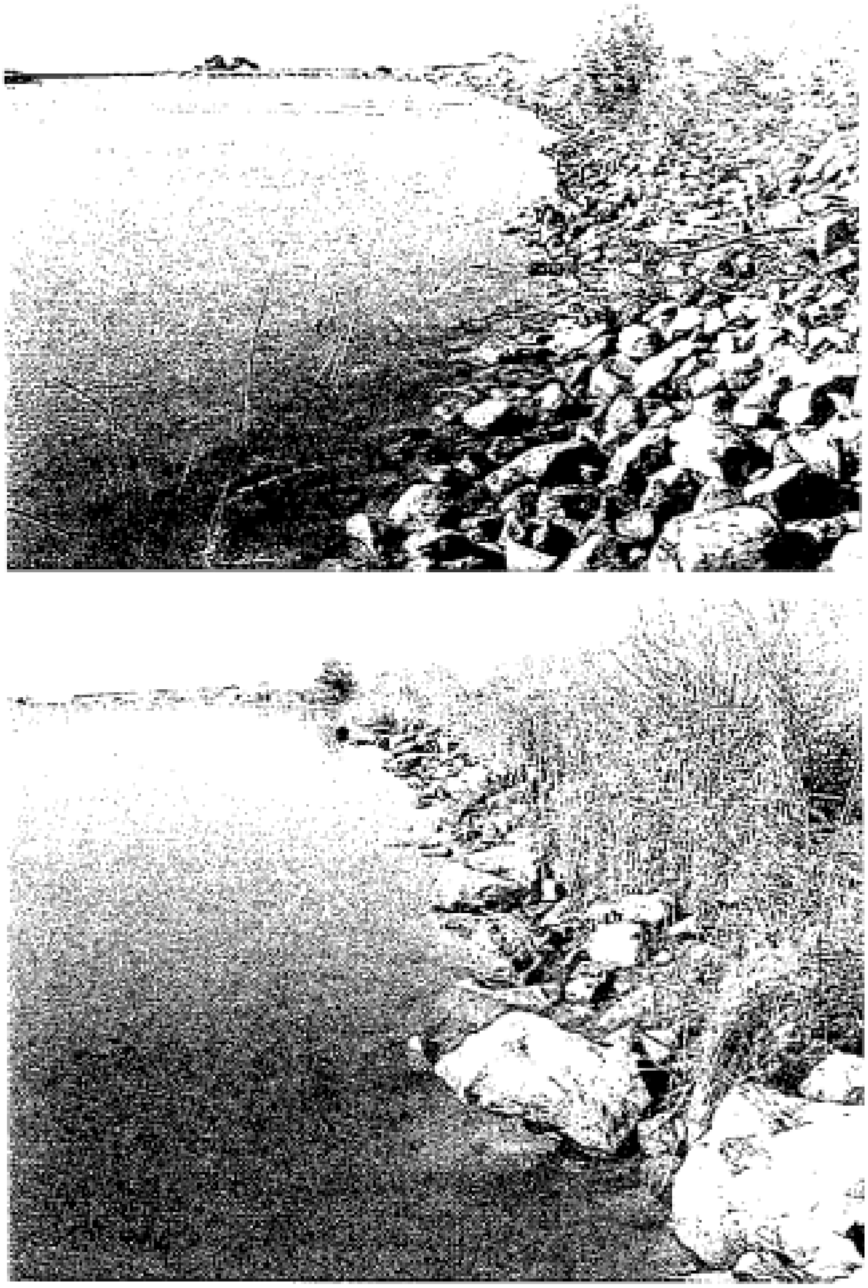
Figure 5



Experimental Tule ***(Scirpus californicus)*** and **Rush *(Juncus effusus)***
Plantings **on** North **Fork** Mokelumne River

This area on the North Fork of the Mokelumne River is a moderately impacted site located within a shallow water mudflat upstream of the outside bend *of* the river. Despite severe wave and current energies, the plants appear to be thriving due to the presence of a shallow berm.

Figure 6



Experimental Tule (*Scirpus californicus*) and Rush (*Juncus effusus*) Plantings on North Fork Mokelumne River

This area on the North Fork *of* the Mokelumne River is a severely impacted site located along a steep riprap embankment on the outside bend of the river. Wave energies impacting a steep embankment, coupled with lack of sediment, pose challenging conditions for tule establishment.

Environmental Compliance Checklist

All applicants **must** fill out this Environmental Compliance Checklist. Applications **must** contain answers to the following questions to be responsive and to be considered for funding. ***Failure to answer these questions and include them with the application will result in the application being considered nonresponsive and not considered for funding.***

1. Do any of the actions included in the proposal require wmpliance with either the California Environmental Quality Act (CEQA), the National Environmental Policy Act (NEPA), or both?

✓
YES ___ NO ___

2. **If you answered yes to # 1, identify the lead governmental agency for CEQA/NEPA compliance.**

Reclamation Districts
Lead Agency

3. If you answered no to # 1, explain why CEQA/NEPA compliance is not required for the actions in the proposal.

4. **If CEQA/NEPA compliance is required, describe how the project will comply with either or both of these laws. Describe where the project is in the compliance process and the expected date of completion.**

We anticipate a categorical exemption under CEQA. Of the 29 classes of categorical exemptions, the proposed project falls into class 2, the replacement ... of existing structures .... We are replacing the tules that once occurred in this part of the Delta.

5. **Will the applicant require access across public or private property that the applicant does not own to accomplish the activities in the proposal?**

✓
YES ___ **NO** ___

If yes, the applicant must attach written permission for access from the relevant property owner(s). Failure to include written permission for access may result in disqualification of the proposal during the review process. Research and monitoring field projects for which specific field locations have not been identified will be required to provide access needs and permission for access with 30 days of notification of approval.

The first phase of the project entails surveys by boat, which do not require permission for access. The first phase studies will identify where the implementation will occur, after which we will seek permission for access.

6. Please indicate what permits or other approvals may be required for the activities contained in your proposal. Check all boxes that apply.

LOCAL

Conditional use permit	___	
Variance	___	
Subdivision Map Ad approval	___	
Grading permit	___	
General plan amendment	___	
Specific plan approval	___	
Rezone	___	
Williamson Act Contract cancellation	___	
Other ____________ (please specify)		
None required	___	

STATE

CESA Compliance	___	(CDFG)
Streambed alteration permit	✓	(CDFG)
CWA § 401 certification	✓	(RWQCB)
Coastal development permit	___	(Coastal Commission/BCDC)
Reclamation Board approval	✓	
Notification	___	(DPC, BCDC)
Other ____________ (please specify)		
None required	___	

FEDERAL

ESA Consultation	✓	(USFWS)
Rivers & Harbors Act permit	___	(ACOE)
CWA § 404 permit	✓	(ACOE)
Other ____________ (please specify)		
None required	___	

DPC = Delta Protection Commission
CWA = Clean Water Act
CESA = California Endangered Species Act
USFWS = U.S. Fish and Wildlife Service
ACOE = U.S. Army Corps of Engineers

ESA = Endangered Species Act
CDFG = California Department of Fish and Game
RWQCB = Regional Water Quality Control Board
BCDC = Bay Conservation and Development Comm

Land Use Checklist

All applicants must fill out this Land Use Checklist for their proposal. Applications must contain answers to the following questions to be responsive and to be considered for funding. *Failure to answer these questions and include them with the application will result in the application being considered nonresponsive and not considered for funding.*

1. Do the actions in the proposal involve physical changes to the land (i.e. grading, planting vegetation, or breeching levees) **or** restrictions in land use (i.e. conservation easement or placement of land in a wildlife refuge)?

   ✓ YES   Planting vegetation only.   ___ NO

2. If **NO** to # **1**, explain what type of actions are involved in the proposal (i.e., research only, planning only).

3. **If YES to # 1, what is the proposed land use change or restriction under the proposal?**

   None

4. If **YES** to # **1**, is the land currently under a Williamson Act contract?

   ___ YES   ✓ NO

5. If **YES** to # **1**, answer the following:

   Current land use floodway
   Current zoning ___
   Current general plan designation ___

6. If **YES** to **#1**, is the land classified as Prime Farmland, Farmland of Statewide Importance or Unique Farmland on the Department of Conservation Important Farmland Maps?

   ___ YES   ✓ NO   **DON'T** ___ KNOW

7. If **YES** to # **1**, how many acres of land **will** be subject to physical change or land use **restrictions** under the proposal?
   Several acres (3-4?)

8. If **YES** to # **1**, is the property currently being commercially farmed **or** grazed?

   ___ YES   ✓ NO

9. If **YES** to **#8**, what are   the number of employees/acre None
   the **total** number of employees None

10. Will the applicant acquire any interest in land under the proposal (fee title **or** a conservation easement)?

YES ________   **NO** ________

11. What entity/organization **will** bold the interest? Reclamation District, State Lands ?

12. If **YES to # 10,** answer the following:

Total number of acres to be acquired under proposal ________ None
Number of acres to be acquired in fee ________ None
Number of acres to be subject to conservation easement ________ None

13. **For** all proposals involving physical changes **to** the land **or** restriction in land use, describe what entity **or** organization **will:**

manage the property ________ ?
provide operations and maintenance services ________ ?
conduct monitoring ________ ?

14. **For** land acquisitions (fee title **or** easements), will existing water rights also be acquired?

N.A.

YES ________   **NO** ________

15. **Does** the applicant propose any modifications to **the** water right **or** change in the delivery **of** the water?

YES ________   **NO** ________

16. If **YES to # 15,** describe____

STATE OF CALIFORNIA

NONDISCRIMINATION COMPLIANCE STATEMENT

STD. 19 (REV. 3-95)

COMPANY NAME
Habitat Assessment & Restoration Team, Inc.

The company named above (herinafter referred to as "prospective contractor") hereby certifies, unless **specifically** exempted, compliance with Government Code Section 12990 (a-f) and California Code of Regulations, Title **2,** Division **4,** Chapter 5 in matters relating to reporting requirements and the development, implementation and maintenance of a Nondiscrimination **Program.** Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employee or applicant for employment **because** of sex, race, color, ancestry, religious creed, national origin, physical disabitity (including HIV and AIDS), medical condition (cancer), age (over 40), marital status, denial of family care leave and denial of pregnancy disability leave.

CERTIFICATION

I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I am fully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California.

OFFICIAL'S NAME
Jeffrey A. Hart
Jeffrey A. Hart

DATE EXECUTED	EXECUTED IN THE COUNTY OF
5/16/00	

PROSPECTIVE CONTRACTOR'S SIGNATURE
Jeffrey A. Hart

PROSPECTIVE CONTRACTOR'S TITLE
President

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME
Habitat Assessment & Restoration Team, Inc.

CALIFORNIA
CONTRACTOR

LICENSE NUMBER 763504

BOND NUMBER 6036402

HABITAT ASSESSHENT 8 RESTORAT

BOND EXPIRATION DATE 04/30/2001

HART Inc
Habitat Assessment
& Restoration Team

May 12,2000

Delta Protection Commission
14215 River Road
P.O. Box 530
Walnut Grove, CA 95690

To Whom It May Concern:

This is to notify you that the Habitat Assessment & Restoration Team, Inc. is submitting a CALFED proposal for funds to study the restoration potential of tules in different areas of the Delta, including Sacramento, San Joaquin, Contra Costa, and San Joaquin Counties. I am sending you a copy of the executive summary that will acquaint you with our proposed project.

Sincerely,

Jeffrey A. Hart

Jeffrey A. Hart

13737 Grand Island Road
Walnut Grove, CA 95690
phone: 916/775-4021
fax: 916/775-4022

HART Inc.
Habitat Assessment
& Restoration Team

May 12,2000

Sacramento County Board of Supervisors
700 H. Street, Suite 304
Sacramento, CA 95814

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fax: 916/775-4022

H.A.R.T. Inc

Habitat Assessment & Restoration Team

May 12,2000

Sacramento County Planning Department
827 7th Street
Sacramento, CA 95814

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Sincerely,

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13737 Grand Island Road
Walnut Grove, CA 95690
phone: 916/775-4021
fax: 916/775-40[illegible]

HART Inc.
Habitat Assessment
& Restoration Team

May 12,2000

Clerk
Solano County Board of Supervisors
580 Texas Street
Fairfield, California **94533**

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H.A.R.T. Inc.
Habitat Assessment
& Restoration Team

May 12,2000

Solano County Planning Department
601 Texas Street
Fairfield, California 94533

To Whom It May Concern:

This is to you that the Habitat Assessment & Restoration Team, Inc. is submitting a CALFED proposal for funds to study the restoration potential of tules in different areas of the Delta, including Sacramento, San Joaquin, Contra Costa, and San Joaquin Counties. I am sending you a copy of the executive summary that will acquaint you with our proposed project.

Sincerely,

Jeffrey A. Hart

Jeffrey A. Hart

13737 Grand Island Road
Walnut Grove, CA 95690
phone: 916/775-4021
fax: 916/775-4022

H.A.R.T. Inc.
Habitat Assessment & Restoration Team

May 12,2000

San Joaquin
County Board of Supervisors
222 E. Weber Ave.
Courthouse Room 701
Stockton, CA 95202

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H.A.R.T. Inc.
Habitat Assessment
& Restoration Team

May 12,2000

San Joaquin County
Community Development and Planning Department
1810 E. Hazelton Ave.
Stockton, CA 95205

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13737 Grand Island Road
Walnut Grove, CA 956[illegible]
phone: 916/775-4021
fax: 916/[illegible]

H.A.R.T. Inc
Habitat Assessment
& Restoration Team

May 12, 2000

Clerk
Contra Costa County
Board of Supervisors
651 Pine Street, Room 106
Martinez, CA 94553

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Walnut Grove, CA 95690
phone: 916/775-4021
fax: 916/775-4022

H.A.R.T. Inc.
Habitat Assessment & Restoration Team

May 12,2000

Dennis Barry
Contra Costa County
Community Development Director
651 Pine Street
4th Floor - North Wing
Martinez, CA 94553

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Walnut Grove, CA 95690
phone: 916/775-4021
fax: 916/775-4022

OMB Approval No. 0348-0043

APPLICATION FOR FEDERAL ASSISTANCE

2. DATE SUBMITTED: 5-30-00

Applicant Identifier

1. TYPE OF SUBMISSION

Application
☑ Construction
☐ Non-Construction

Preapplication
☐ Construction
☐ Non-Construction

3. DATE RECEIVED BY STATE

State Application Identifier

4. DATE RECEIVED BY FEDERAL AGENCY

Federal Identifier

5. APPLICANT INFORMATION

Legal Name: Habitat Assessment and Restoration Team Inc.

Organizational Unit:

Address *(give city, county, State, and zip code)*:
13737 Grand Island Road
Walnut Grove, CA 95690

Name and telephone number of person to be contacted on matters involving this application *(give area code)*: Jeff Hart (916) 775-4021

6. EMPLOYER IDENTIFICATION NUMBER *(EIN)*: 94-3274391

7. TYPE OF APPLICANT: *(enter appropriate letter in box)* M

A. State
B. County
C. Municipal
D. Township
E. Interstate
F. Intermunicipal
G. Special District
H. Independent School Dist.
I. State Controlled Institution of Higher Learning
J. Private University
K. Indian Tribe
L. Individual
M. Profit Organization
N. Other (Specify)

8. TYPE OF APPLICATION

☑ New ☐ Continuation ☐ Revision

Revision, enter appropriate letter(s) in box(es) ☐ ☐

A. Increase Award B. Decrease Award C. Increase Duration
D. Decrease Duration Other *(specify)*:

9. NAME OF FEDERAL AGENCY: CVPIA - Bureau of Reclamation

10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: N.A

TITLE

11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT: Delta Tules: Assessment of Restoration Opportunities

12. AREAS AFFECTED BY **PROJECT** *(Cities, Counties, States, etc.)*: Sacramento, San Joaquin, Contra Costa, Solano Counties

13. PROPOSED PROJECT: Delta Tule restoration

Start Date: Jan 2001
Ending Date: Jan 2004

14. CONGRESSIONAL DISTRICTS OF: 7th, 10th & 3rd Districts

a. Applicant: Habitat Assessment Restoration Team

b. Project: Delta Tules

15. ESTIMATED FUNDING

a. Federal	$	.00
b. Applicant	$	.00
c. State	$	.00
d. Local	$	.00
e. Other	$	.00
f. Program Income	$	.00
g. TOTAL	$ 1,470,000	.00

16. IS APPLICATION **SUBJECT** TO REVIEW BY STATE EXECUTIVE ORDER **12372** PROCESS? N.A.

a. YES. THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON

DATE

b. No. ☐ PROGRAM IS NOT COVERED BY E.O. 12372
☐ OR PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW

17. IS THE APPLICANT **DELINQUENT** ON ANY FEDERAL DEBT?

☐ Yes If "Yes," attach an explanation. ☑ No

18. TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL DATA IN THIS **APPLICATION/PREAPPLICATION** ARE TRUE AND CORRECT, THE DOCUMENT HAS BEEN DULY AUTHORIZED BY THE GOVERNING BODY OF THE APPLICANT AND THE APPLICANT WILL COMPLY **WITH** THE ATTACHED ASSURANCES IF THE ASSISTANCE IS AWARDED.

a. Type Name of Authorized Representative: Jeffrey A. Hart

b. Title: President

c. Telephone Number: (916) 775-4021

d. Signature of Authorized Representative: Jeffrey A. Hart

e. Date Signed: 5-30-00

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Standard Form **424 (Rev. 7-97)**
Prescribed by OMB Circular **A-102**